



ICAR NICHE AREA OF EXCELLENCE
SMC COLLEGE OF DAIRY SCIENCE
ANAND AGRICULTURAL UNIVERSITY
ANAND 388110 (GUJARAT)



ANNUAL REPORT (2008-09)

**FUNCTIONAL FERMENTED DAIRY PRODUCTS
WITH SYNBIOTICS**

(Started on September 13, 2006)

Goal

- Capacity building in area of functional fermented dairy products with synbiotics in terms of technology as well as human resource development.

Objectives

- To modify the existing synbiotic products and/or to formulate new synbiotic functional fermented dairy foods with fruits and vegetables.
- To add value to functional dairy products with synbiotics by incorporating fruits/vegetables.
- To study therapeutic and nutritional aspects of functional dairy products with synbiotics.
- To organize HRD/ training programs/ seminars on Probiotics/ Dairy Starter Cultures and Formulation of New Functional Fermented Dairy Products with Synbiotics for capacity building.

Staff

Principal Investigator : Dr RK Shah, Professor, DM (till 31-03-09)
Dr JB Prajapati, Professor & Head, DM (01-04-09 onwards)

Co-Principal Investigator: Ms Suja Senan, Asst. Prof., DM

Research Workers: Mr CH.V.K. Sudheendra
Ms T. Madhavi

Research

Title A : Development of Synbiotic *Lassi* with Carrot Juice

Name of the Scientist: **Dr. Rajiv K. Shah**

Research Student: **CH.V.K. Sudheendra**

Research Methodology:

For preparation of synbiotic lassi with carrot juice (Blend - B), cows' whole milk was added with carrot juice, prebiotic oligofructose and sugar, heat processed, cooled and inoculated with probiotic culture *L. rhamnosus* MTCC 5463. While the plain probiotic lassi (Blend-A) was prepared by adding only sugar.

Both the blends A and B were incubated at 37 °C till the acidity reached to 0.65 % LA. and then kept at refrigerated temperature for overnight. Later these samples were stirred to get uniform body. Then the two blends of lassi samples were filled in bottles (approx. 200 ml) individually, crown capped and stored at 4 ± 1 °C for a period of 28 days, during which microbiological, chemical parameters as well as sensory attributes were evaluated at an interval of 7 days.

Salient findings:

- The gross chemical composition of plain probiotic *lassi*- (A) and synbiotic *lassi* added with carrot juice (B) indicated (percentage) moisture - 77.15 to 79.40, T.S.- 20.60 to 22.85, fat -3.73 -3.95, protein - 3.25 to 3.32, ash - 0.66 to 0.69 and carbohydrates - 12.74 to 15.12 (by difference).
- All samples were having the initial count of lactobacilli well above 10^8 cfu/g, which reduced marginally but still remained well above 10^8 cfu/g throughout the refrigerated storage period of 28 days.
- Preparation and storage of the product under entirely controlled provision resulted in absence of coliforms and yeast and mold in 10 g of sample for the fresh as well as stored samples.
- Fresh samples were having acidity of 0.65 % LA. The acidity increased gradually in both the treatments during storage of the samples and at the end of storage period blend B had the highest acidity (1.32), followed by blend A (1.26).
- The initial pH value at 0 day was almost similar (4.63 to 4.68) for both treatments.
- In the fresh *lassi* blends the highest FFA value was for blend B ($0.55 \mu\text{g/g}$) followed by A ($0.52 \mu\text{g/g}$).
- The tyrosine value increased marginally during storage.
- From the sensory analysis on 9-point hedonic scale by an expert panel of five judges; it was clear that all the parameters (colour and appearance, flavour, body and texture and overall acceptability) for the blend of synbiotic *lassi* with carrot juice (B) was superior from plain probiotic *lassi*-control sample (A), when they were fresh and even at the end of 28 days refrigerated storage.
- It was observed that for the freshly made products, the flavour score was the highest for sample B (8.1) followed by control sample A (7.8).

- Both plain probiotic *lassi* and synbiotic *lassi* with carrot juice were very well acceptable at the end of 28 days refrigerated storage. The synbiotic *lassi* with carrot juice was liked the most than plain probiotic *lassi* by the judges throughout the storage period.

Title B: Synbiotic Whey Drink with Orange Juice

Name of the Scientist: **Dr. Rajiv K. Shah**

Research Student: **Ms. T. Venkata Madhavi**

Research Methodology:

The work was carried out for formulation of functional probiotic/Synbiotic whey drink with orange juice and also to study their microbiological, physico-chemical and sensory profiles. Whey based functional foods were formulated in two different forms; A [whey + sugar + orange juice], B [A + inulin], and inoculated with probiotic culture *Lb. rhamnosus* @ 2.0% v/v.

The two blends (A and B) developed were subjected to microbiological, physico-chemical and sensory analyses initially for the fresh (0 day) and up to 28 days of stipulated refrigerated storage at an interval of 7 days at $4 \pm 1^\circ\text{C}$.

Salient findings:

- The average chemical composition (% w/w) for the whey used to manufacture whey drink was moisture 93.56, T.S.; 6.4, fat 0.50; protein, 0.7; ash, 0.40 and carbohydrate (by difference), 4.80.
- During refrigerated storage for 28 days, *lactobacillus* count remained above 10^8cfu/ml for both the samples (A and B).
- The yeast and mold as well as coliform were absent in 10g product throughout the refrigerated storage period.
- There was slight increase in acidity during refrigerated storage. Identical trend was observed for elevation in lactic acid value from 0.70 to 0.90 % LA in both samples A and B for the entire refrigerated period of storage from 0 to 28 days.
- Similarly, the pH also showed decline from initial 3.98 to final 3.68 in both the samples during storage study (0 to 28 days).
- The changes in FFA contents ($\mu\text{eq/ml}$) during storage were found non-significant, indicating that the ingredients had no major impact on extent of lipolysis.
- The increase in tyrosine content (0.51 to 0.67 $\mu\text{g}/5\text{ml}$) for the treatments (A and B) was relatively very low during entire length of storage period.
- The sensory analysis on 9-point hedonic scale by expert panel members was done. Among two samples (A and B), flavour of B (inulin) was distinctly superior than A throughout the storage period of 0 to 28 days at 4°C .
- The samples obtained the high colour and appearance scores, indicating that neither addition of sugar nor orange juice had no significant impact on the treatments during entire period of storage study.
- The overall acceptability scores for the samples (A and B) declined marginally during entire period of refrigerated storage.

- The minor physico-chemical changes during the storage had slightly negative impact on the sensory parameters, but at the end of stipulated refrigerated storage period of 28 days, all the samples (A and B) remained acceptable.

Human Resource Development

- One Day Awareness Work shop on “Promotion of Human Health Using Synbiotics” was organized for the benefit of 136 participants including UG/PG students (123) and staff members (13) of various colleges around Anand, teaching microbiology as well as biotechnology at SMC College of Dairy Science, AAU, Anand on 26 February 2009. Four lectures were delivered (i) Introduction to functional foods and synbiotics by Dr RK Shah; (ii) Probiotics: Types, selection criteria and their health benefits by Dr JB Prajapati, (iii) Probiotic dairy products by Ms Sreeja P. Kumar and (iv) Role of prebiotics and synbiotics in promoting human health by Dr RK Shah. This was followed by around one and half hour discussion and answering the queries of the participants. This was the first programme for the students and was very much appreciated by all the participants.
- Beneath the Lab to Dairy Plant initiative “One Day Lab to Dairy Plant Workshop” was organized at Sumul Dairy on the topic “Synbiotic Dairy Products” on 26th March, 2009. Two lectures viz. (i) Probiotic Dairy Products by Dr JB Prajapati and (ii) Functional Fermented dairy Products with Synbiotics - opportunities for Value Addition by Dr RK Shah were delivered. From Sumul Dairy, 28 officers, up to the cadre of General Manager actively participated in the programme and discussion.
- Two students earned their MSc degree based on the research done under the niche Area.
- More than 15 vice-Chancellors of SAU’s visited the centre during 4th IAUA VC’s conference at AAU apart from several other visitors.

Financial Report

AAU - BH NO. 2030-12 ICAR NICHE AREA OF EXCELLENCE

BUDGET HEAD	FINANCIAL YEAR (Rs. in lakhs)					
	2006-07		2007-08		2008-09	
	ALLOTED	SPENT	ALLOTED	SPENT	ALLOTED	SPENT
NON-RECURRING						
EQUIPEMENT	32.50	32.50	0.00	0.00	0.00	0.00
WORKS	36.50	36.50	0.00	0.00	0.00	0.00
RECURRING						
TRAVEL	2.00	0.08	2.00	0.08	0.35	0.26
TRAINING	1.50	1.38	3.00	3.00	0.30	0.00
OPERATIONAL	10.50	10.50	40.00	39.90	50.60	54.31
CONTRACTUAL SERVICES	2.00	1.62	10.00	9.60	3.75	0.22
TOTAL	85.00	82.58	55.00	52.58	55.00	54.79
% GRANT UTILIZATION		97.15		95.60		99.62

TECHNICAL PROGRAMME FOR 2009-10

RESEARCH

- Formulation of new functional Dairy Food with synbiotics *viz.* synbiotic herbal lassi and synbiotic oat based lassi are under development.
- Nutritional evaluation of the developed products for amino acid profile, vitamins, minerals, etc. is going on.
- Human Clinical Trial for assessment of health benefit of synbiotic lassi is planned.

HRD

- One training program (5 days) for food industry's technical staff
- One training program (3 weeks) for academic staff of universities and ICAR institutions.
- One Lab to Dairy Plant seminar at one of the dairy plants of Gujarat.

BUDGET (2009-10)

BUDGET HEAD	Grant Allotted (Rs. Lakhs)	Grant spent (30-09-09)(Rs. Lakhs)	Additional Grant Required (Rs. Lakhs)
NON-RECURRING			
EQUIPEMENT*	5.00 + 5.00	0.00	5.00 (31.00)*
WORKS	5.00 + 5.00	0.00	0.00
RECURRING			
TRAVEL	5.00 + 5.00		5.00
TRAINING			
OPERATIONAL		1.37	
CONTRACTUAL SERVICES		0.53	
TOTAL	30.00	1.90	10.00

List of Equipment to be purchased (2009-10).

Sr. No.	Item	Numbers	Estimated cost (Rs. in lakhs)
1	Thermocycler with accessories	1 lot	06.00
2	Stomacher	1 lot	04.00
3	De-gaser for HPLC	1 lot	00.50
4	Miscellaneous laboratory and office equipments	1 lot	04.50
	TOTAL		15.00
	<i>Additional equipment may be purchased subject to sanction of grant</i>		
5	Real Time PCR with accessories	1 lot	15.00
6	Laboratory fermentor with accessories	1 lot	10.00
7	Spiral plater	1 lot	11.00
	TOTAL		36.00

STAFF POSITION

PI : Dr JB Prajapati
Co-PI: Dr R.K. Shah
Ms Suja Senan

STAFF NEEDED FOR 2009-10

1. Research workers – 3
2. Administrative officer – 1
2. Lab. Attendant – 1
4. Sweeper -1

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